

State of the Lakes Ecosystem Conference (SOLEC)

A Current Indicator Process at Work

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Great Lakes Water Quality Agreement

**As amended by protocol
Signed November 18, 1987**

Overall Purpose of Great Lakes Water Quality Agreement

“ . . . to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.”

Great Lakes Water Quality Agreement (1987)

- **Lakewide Management Plans (LaMP)**
- **Remedial Action Plans (RAP) for designated Areas Of Concern (AoC)**
- **Beneficial Use Impairments**
- **Ecosystem Objectives**
- **Indicators**
- **Reporting**

What is SOLEC?

- Sate of the Lakes Ecosystem
Conference
- Biennial report on progress toward meeting goals of the Great Lakes Water Quality Agreement

SOLEC

Objectives

- **Assess the state of the Great Lakes ecosystem based on accepted indicators**
- **Strengthen decision making and management**
- **Inform local decision makers of Great Lakes environmental issues**
- **Provide forum for communication and networking among all stakeholders**

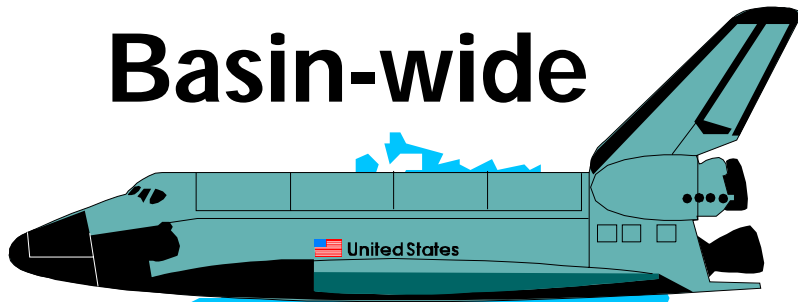
SOLEC Partnerships and Partners

- **BEC**
- **SOLEC Steering Committee**
 - **Federal Agencies**
 - **State/Provincial Agencies**
 - **NGOs**
 - **Industry (including CGLI)**
 - **Binational Commissions**
 - **Private Citizens**

SOLEC Audience

- **Environmental Managers**
- **Local Decision Makers**
- **Senior Level Administration**
- **Public**

Basin-wide



**Different Scales,
Different Uses**

Lake-wide



Local

SOLEC DOES . . .

- **Gather data from monitoring programs**
- **Rely on partnerships and collaboration**
- **Represent the combined voice of Canada and the U.S.**
- **Assess a suite of Great Lakes ecosystem components**
- **Recognize toxic substances as an important stressor**
- **Try to provide assessments to environmental managers & decision-makers**

SOLEC

IS NOT...

- **Regulatory Program**
- **Lake Management Program**
- **Scientific Research Program**
- **Scientific Research Conference**

DOES NOT ...

- **Set Endpoints & Standards**
- **Set Lakewide Goals**
- **Dictate to Monitoring Programs**
- **Assess ONLY Toxic Substances**
- **Maintain Centralized Data Repository**



- **Data Collection**
- **Monitoring**
- **Assessment**
- **Indicator Reports**
- **Conference**
- **Post-conference eval.**
- **State of the Lakes Report(s)**

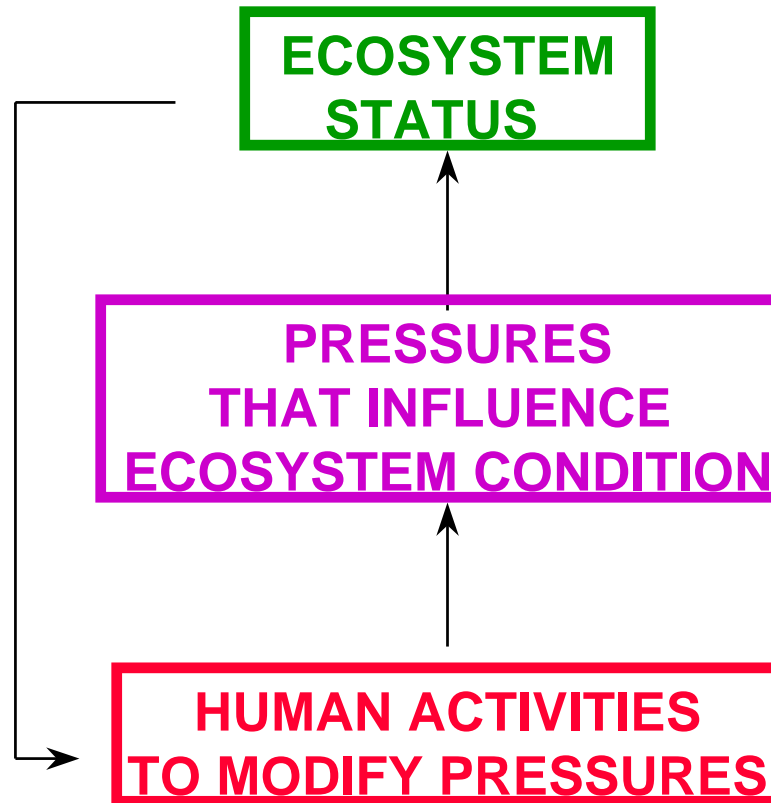
1992 - present

**Q #1. How did SOLEC
select meaningful
indicators?**

Organizing Principles for Great Lakes Indicators

- Build upon the work of others
- **Focus on broad spatial scales**
- Select a framework for subdividing the Great Lakes basin ecosystem
- **Select a system for types of indicators**
- Identify criteria for indicator selection

Indicator Framework: Status - Pressure - Activities



**Focus is on
feedback cycle**

Criteria

- **Necessary, Sufficient, Feasible**
- **Suite of Criteria**
 - Validity, Understandability,
Interpretability, Information Richness,
Data Availability, Timeliness, Cost
Considerations**

Process for Selecting SOLEC Indicators

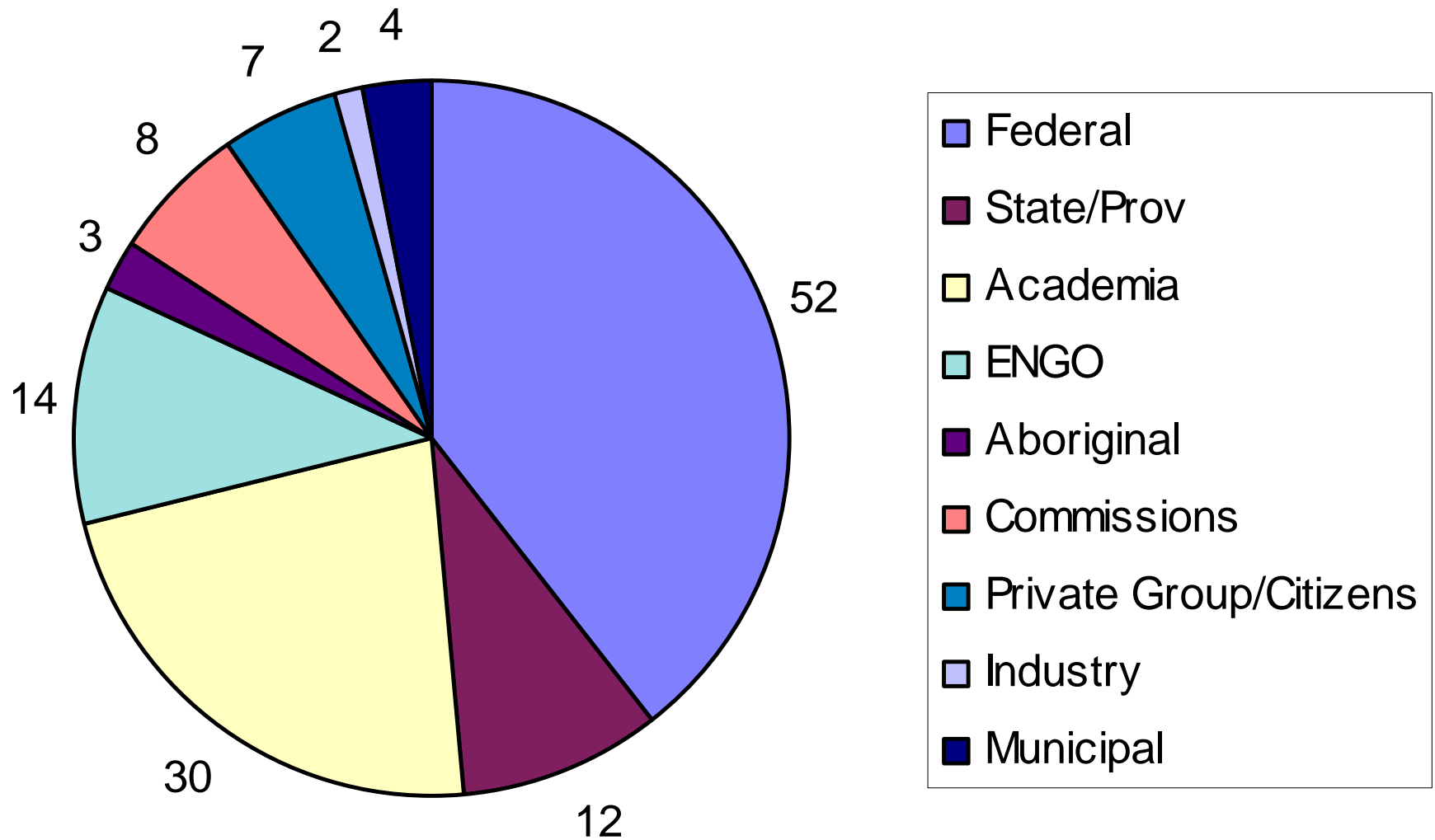
- **Establish Core Groups & Panels of Experts**
Open & Nearshore Waters, Coastal Wetlands, Nearshore Terrestrial, Human Health, Land Use, Societal
- **Mine existing documents for indicators**
- **Select, Revise, Combine, Create Indicators**
- **Propose suite of indicators at SOLEC'98**

Process for Great Lakes Indicators, cont.

- *Involve Stakeholders*
(Review, Revise, Review, Revise, Review, Revise, . . .)
- **Build Consensus, Collaboration, Cooperation**



Number of People Involved in Indicator Development (by group)



Great Lakes Indicator Groups:

- Nearshore and Open Waters
- Coastal Wetlands
- Nearshore Terrestrial
- The Great Lakes Watershed 

- Human Health
- Societal Indicators
 - Urban Issues
 - Socio-economics
 - Societal Response

- Unbounded



Great Lakes Watershed Indicators

- Land Use
- Agriculture
- Forestry
- Tributaries
- Groundwater
- Inland waters & wetlands

Q #2. What monitoring and assessment data are needed to implement the indicators?

SOLEC 2002

- **Experts put together short summaries for 42 indicators**
- **Writers and presenters were asked to assess the indicators**



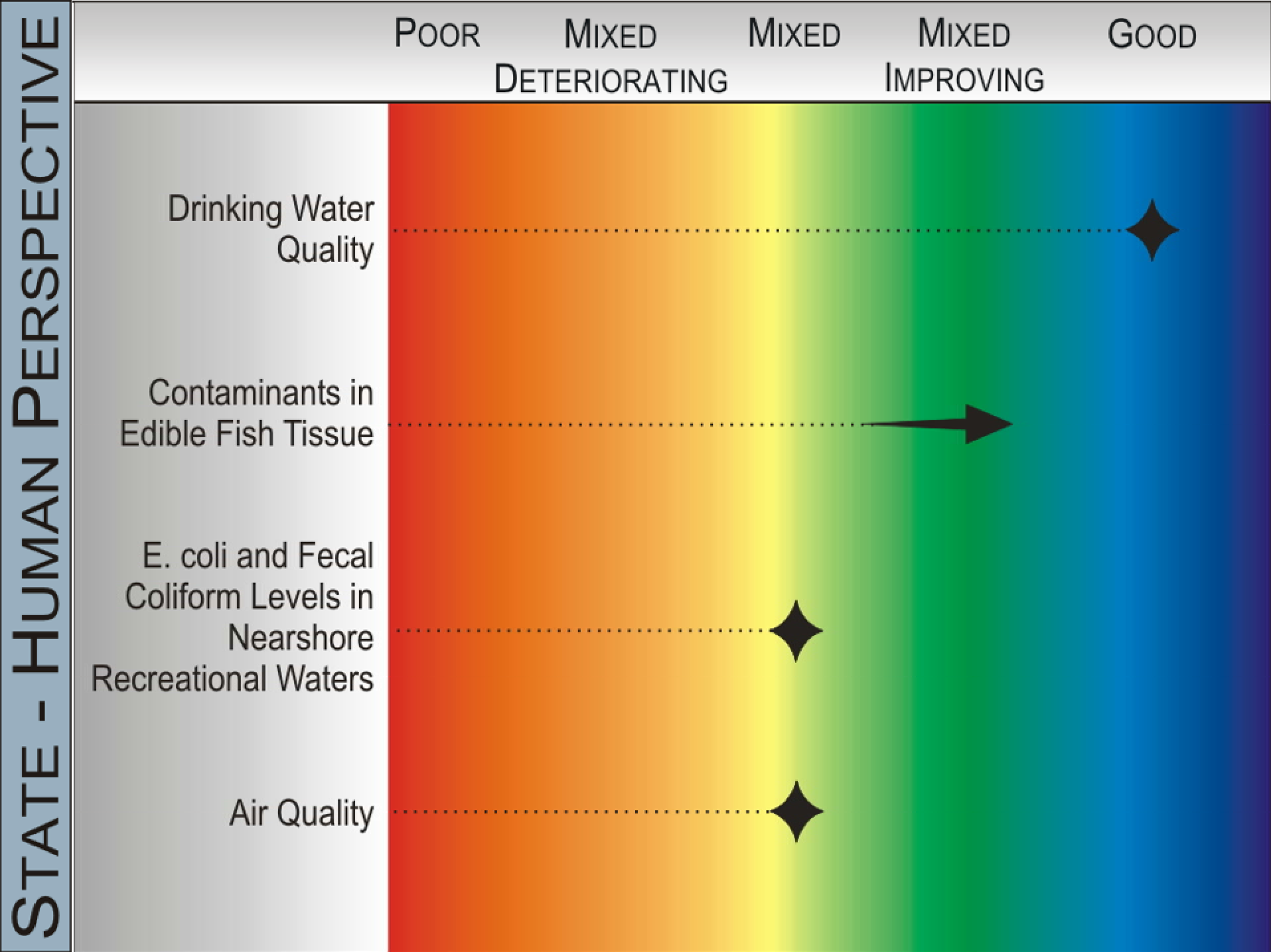
Poor

**Mixed
Deteriorating**

Mixed

**Mixed
Improving**

Good



STATE - ECOSYSTEM PERSPECTIVE

POOR MIXED MIXED MIXED GOOD
 DETERIORATING IMPROVING

Fish

Walleye
 Salmon & Trout
 Lake Trout
 Preyfish Populations

Food Web

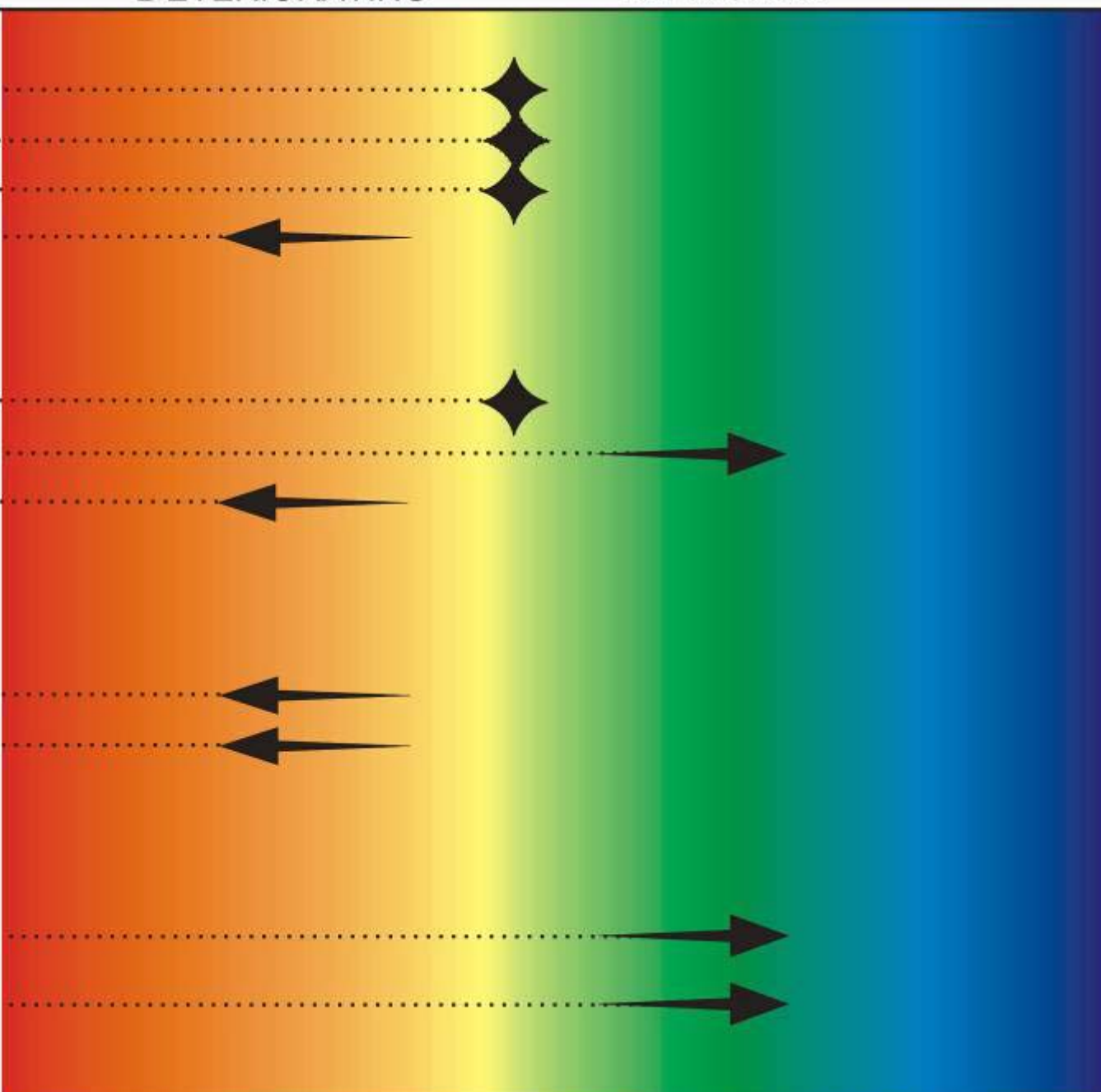
Phytoplankton
 Hexagenia
 Diporeia

Coastal Wetlands

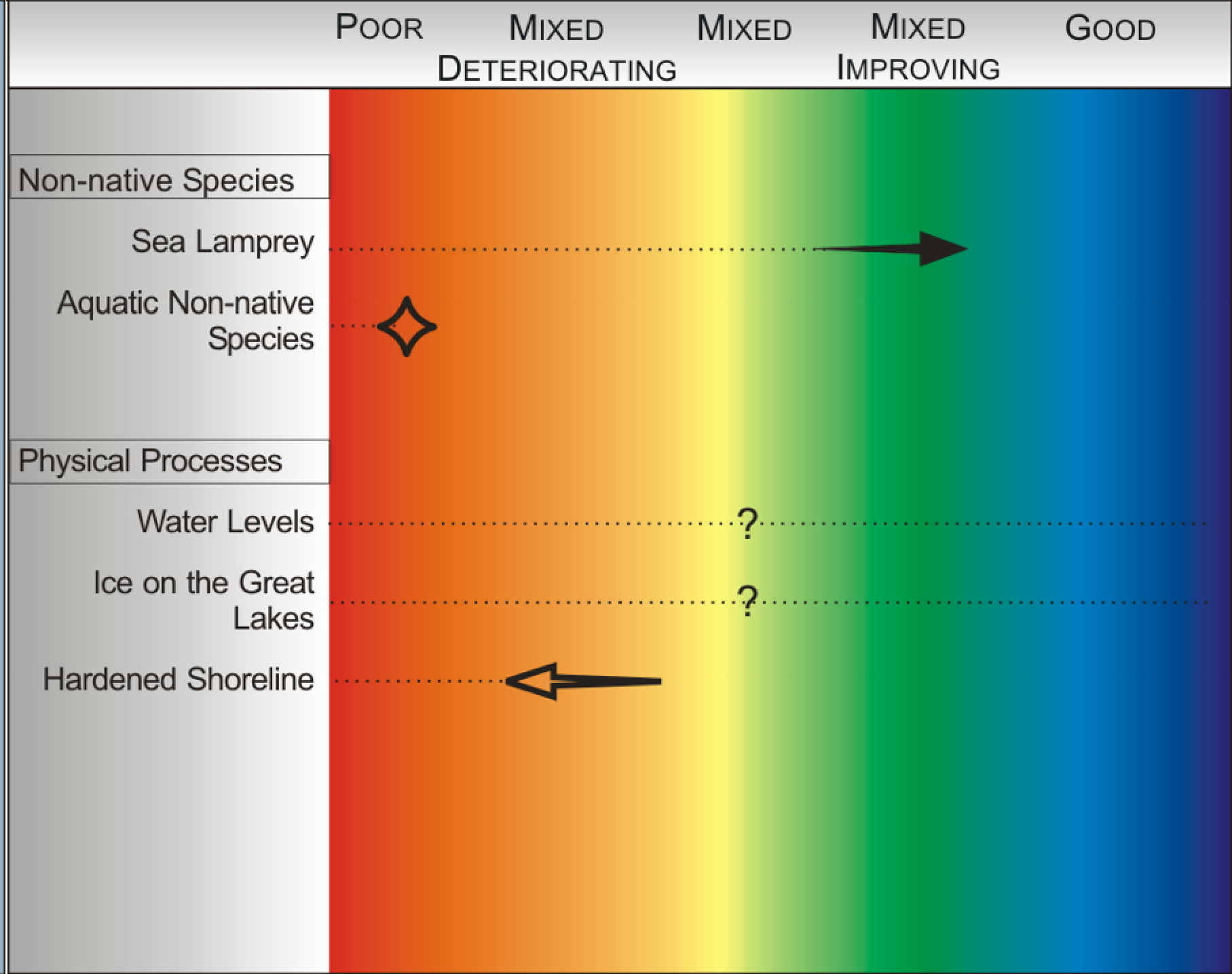
Amphibians
 Wetland Birds

Nearshore Terrestrial

Bald Eagles
 Colonial Nesting
 Waterbirds



PRESSURE-BIOLOGICAL & PHYSICAL



PRESSURE - CHEMICAL

POOR

MIXED

MIXED

MIXED

GOOD

DETERIORATING

IMPROVING

Contaminants in
Aquatic Food Web

Whole Fish

Spottail Shiners

Waterbirds

Snapping Turtle Eggs

Abiotic Environment

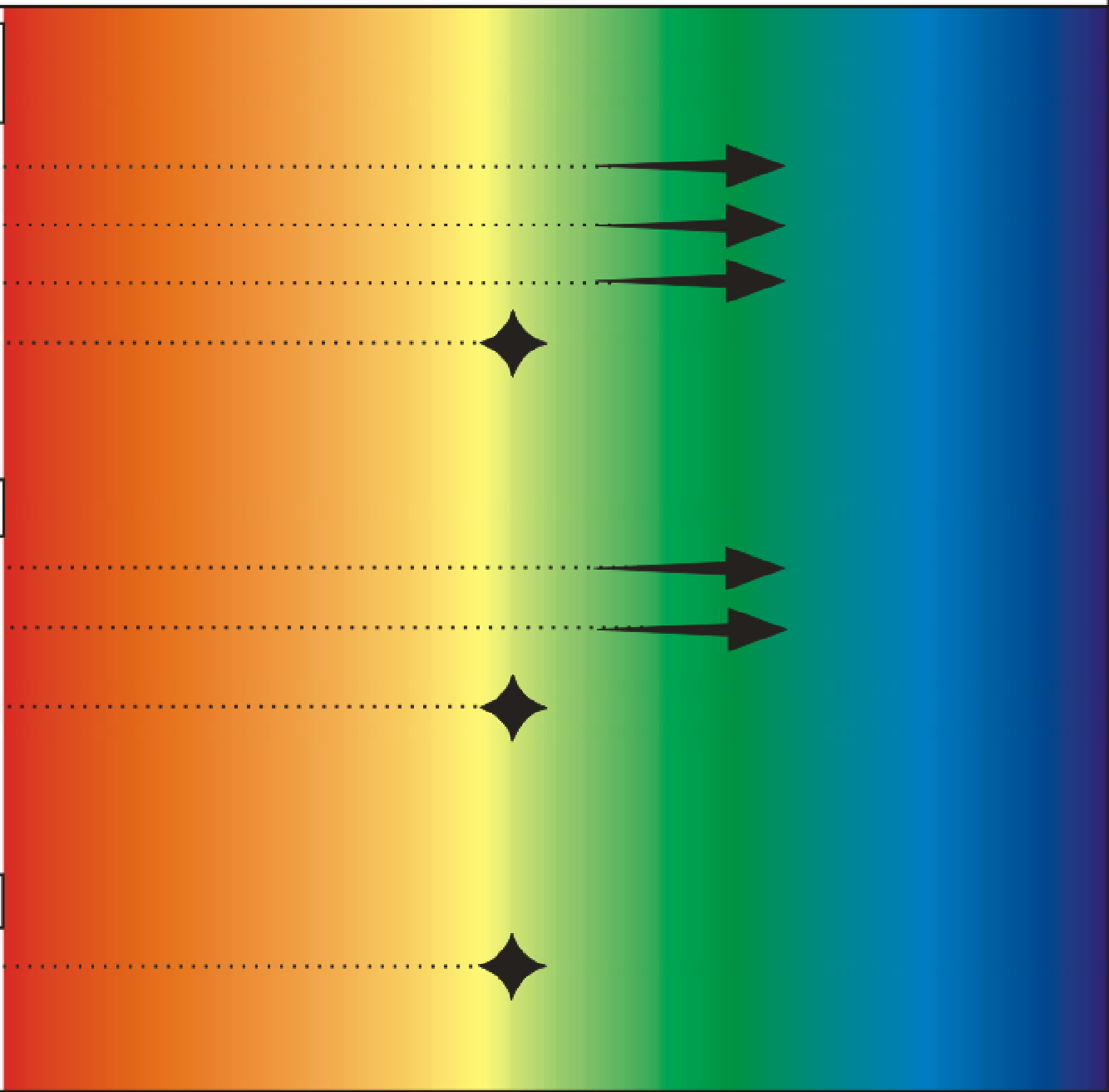
Water

Sediment

Atmospheric
Deposition

Nutrients

Phosphorus



MITIGATING ACTIVITIES

POOR

MIXED

MIXED

MIXED

GOOD

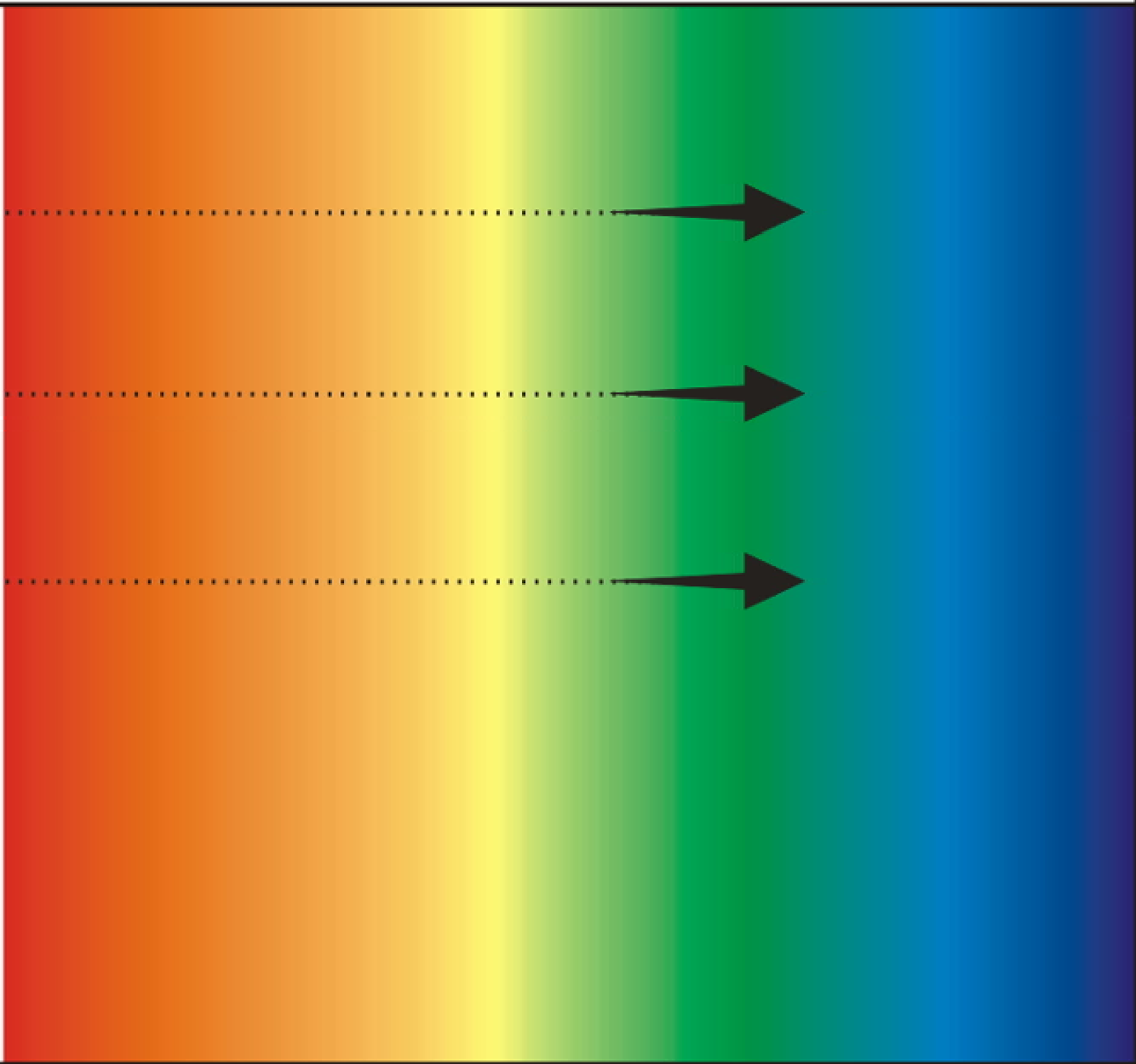
DETERIORATING

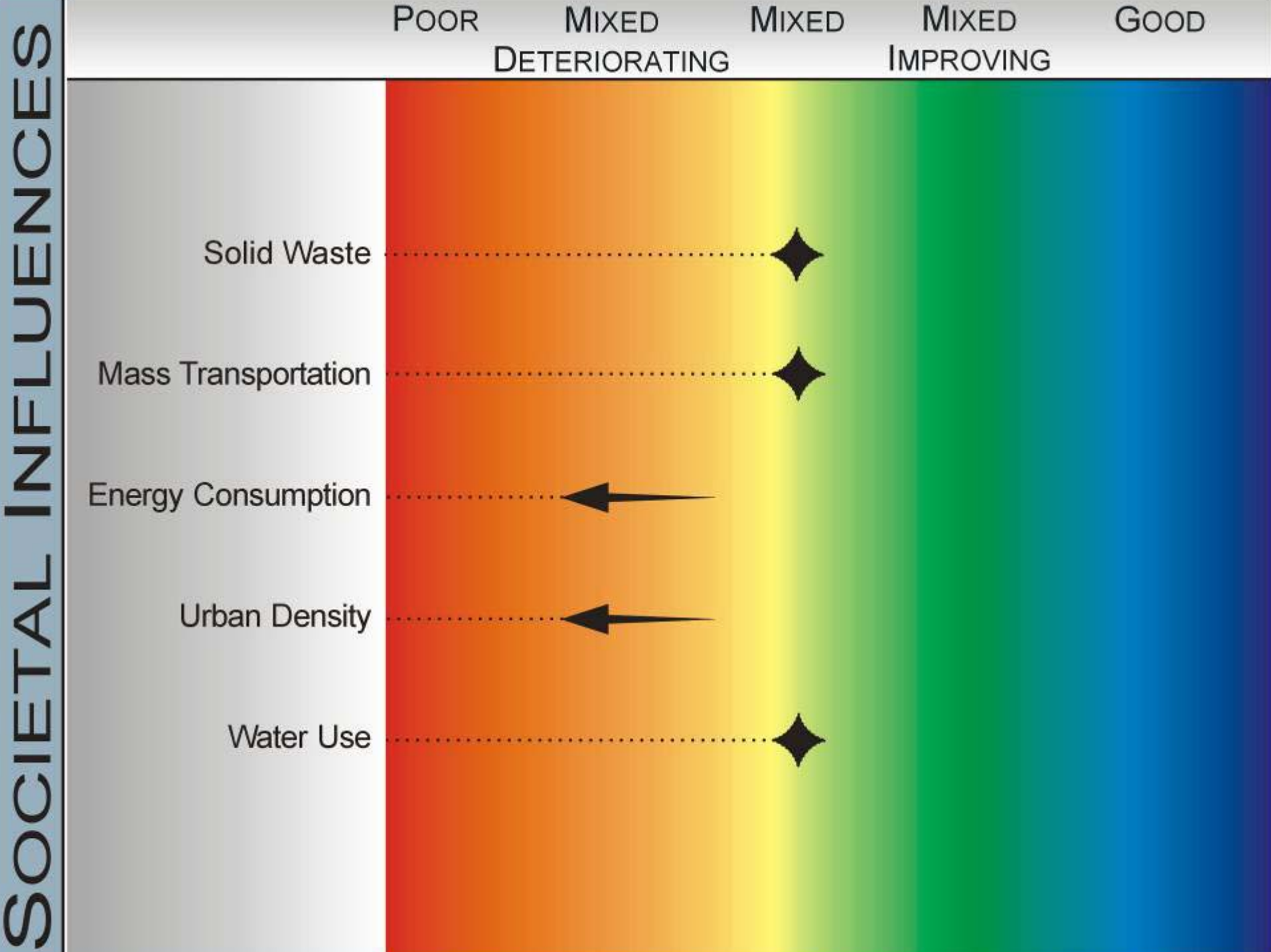
IMPROVING

Stewardship
Activities

Brownfield
Redevelopment

Sustainable
Agriculture





How Big is Your Footprint?

How Big is Your Footprint?



Ecological Footprint

- **Biologically productive area required to**
 - **Produce food**
 - **Produce wood**
 - **Give room for infrastructure**
 - **Absorb CO₂ from burning fossil fuels**
 - **Assimilate waste**

Great Lakes Ecological Footprint



Q #3. How do you report indicators in a meaningful way to show environmental improvements?

Individual Indicator Reports

Title

Assessment

Purpose

Ecosystem Objective

State of the Ecosystem

Future Pressures

Future Activities

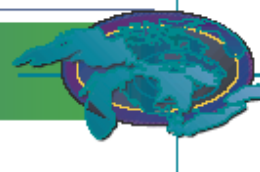
Management Implications

Acknowledgments

Sources

IMPLEMENTING INDICATORS 2003

A TECHNICAL REPORT



Sullivan, W.P., Christie, G.C., Cornelius, F.C., Fodale, M.F., Johnson, D.A., Koonce, J.F., Larson, G.L., McDonald, R.B., Mullet, K.M., Murray, C.K., and Ryan, P.A. *in press*. The sea lamprey in Lake Erie: a case history. *J. Great Lakes Res.* 29 (Suppl. 1)

Phosphorus Concentrations and Loadings

SOLEC Indicator #111

Assessment: Mixed

Purpose

This indicator assesses total phosphorus levels in the Great Lakes, and is used to support the evaluation of trophic status and food web dynamics in the Great Lakes. Phosphorus is an essential element for all organisms and is often the limiting factor for aquatic plant growth in the Great Lakes. Although phosphorus occurs naturally, the historical problems caused by elevated levels have originated from man-made sources. Detergents, sewage treatment plant effluent, agricultural and industrial sources have historically introduced large amounts into the Lakes.

Ecosystem Objective

The goals of phosphorus control are to maintain an oligotrophic state in Lakes Superior, Huron and Michigan; to maintain algal biomass below that of a nuisance condition in Lakes Erie and Ontario; and to eliminate algal nuisance growth in bays and in other areas wherever they occur (GLWQA Annex 3). Maximum annual phosphorus loadings to the Great Lakes that would allow achievement of these objectives are listed in the GLWQA. The expected concentrations of total phosphorus in the open waters of the Great Lakes, if the maximum annual loads are maintained, are listed in the following table:

State of the Ecosystem

Strong efforts begun in the 1970s to reduce phosphorus loadings have been successful in maintaining or reducing nutrient concentrations in the Lakes, although high concentrations still occur locally in some embayments and harbors.

Average concentrations in the open waters of Lakes Superior, Michigan, Huron, and Ontario are at or below expected levels. Concentrations in the three basins of Lake Erie fluctuate from year to year (Figure 1) and frequently exceed target concentrations. In Lakes Ontario and Huron, although most offshore waters meet the desired guideline, some offshore and nearshore areas and embayments experience elevated levels which could promote nuisance algae growths such as the attached green algae, *Cladophora*.

Summarizing the information into an indicator is too subjective until the specifics regarding the metric have been defined.

Future Pressures

Even if current phosphorus controls are maintained, additional loadings can be expected. Increasing numbers of people living along the Lakes will exert increasing demands on existing sewage treatment facilities, possibly contributing to increasing phosphorus loads.

Future Actions

Because of its key role in productivity and food web dynamics of the Great Lakes, phosphorus concentrations continue to be watched by environmental and fishery agencies. Future activities that are likely to be needed include: 1) Assess the capacity and operation of existing sewage treatment plants in the context of increasing human populations being served. Additional upgrades in construction or operations may be required; 2) Conduct sufficient tributary monitoring to support the calculation of annual loadings of phosphorus to each Great Lake by source category (i.e., sewage treatment plans, tributaries, etc.). If the phosphorus

Lake	Phosphorus Guideline ($\mu\text{g/L}$)
Superior	5
Huron	5
Michigan	7
Erie - Western Basin	15

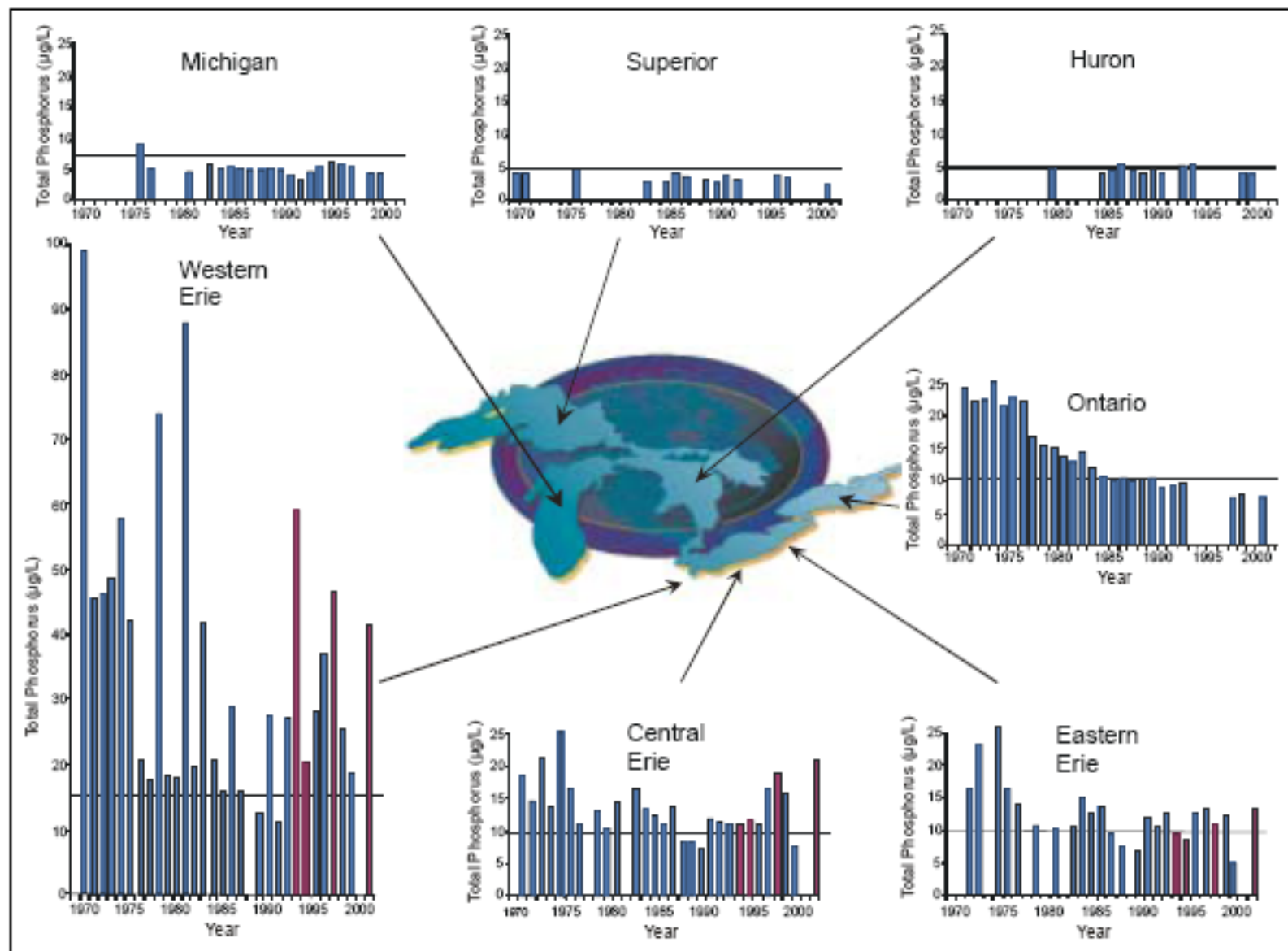


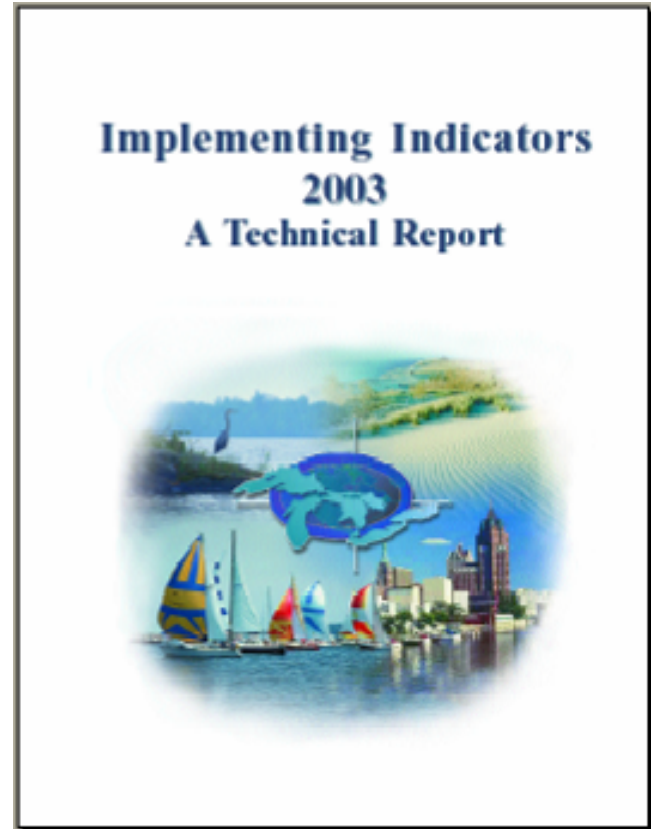
Figure 2. Total phosphorus trends in the Great Lakes 1971-2002 (Spring, Open Lake, Surface). Blank indicates no sampling. Horizontal line on each graphic represents the phosphorus guideline as listed in the Great Lakes Water Quality Agreement for each Lake. Burgundy bar graphs represent Environment Canada data. Blue bar graphs represent U.S. Environmental Protection Agency data.

Source: Environmental Conservation Branch, Environment Canada and U.S. Environmental Protection Agency

Implementing Indicators 2003

A Technical Report

- **Contains full indicator reports as submitted by each author**
- **Contains full references and citations**
- **Contains proposed indicator reports**



Authors, Contributors, Reviewers, Editors

Federal – Canada

Federal – U.S.

States

Provinces

Municipal

Aboriginal

Academic

Coalitions

Commissions

Environmental

Non-Government

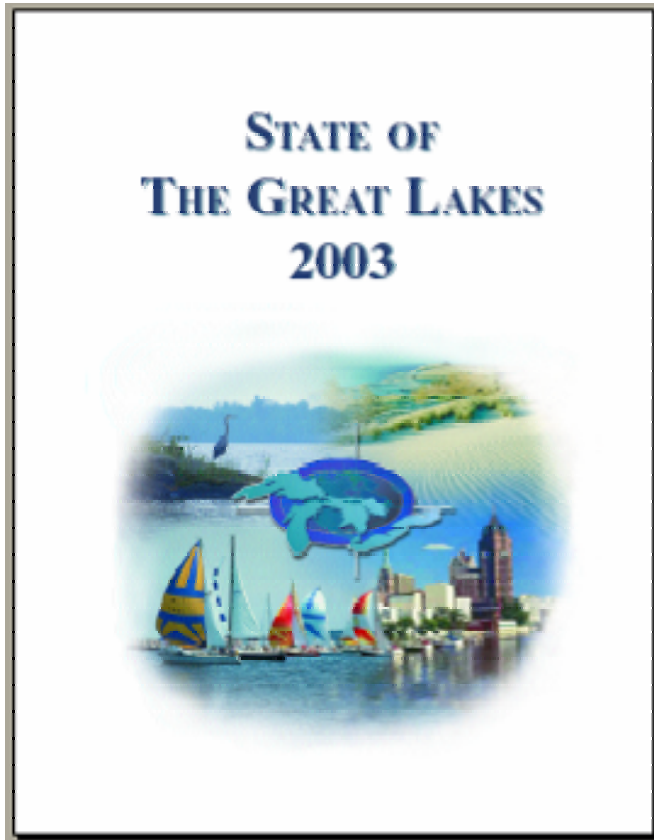
Organizations

Industry

Private Organizations

Private Citizens

State of the Lakes 2003 Standard Report



- **Includes lake and river assessments**
- **Contains summaries of full indicator reports**
- **Most widely used and distributed report**

SOLEC Fact Sheets:

New in 2003!

- For public distribution
- Easy to understand
- Address relevant public issues of “swimm-ability, drink-ability, fish-ability” in the Great Lakes

STATE OF THE GREAT LAKES 2003



CAN WE DRINK THE WATER?

Drinking Water Quality

The Issue: Millions of people depend on the Great Lakes for drinking water free of chemical and microbial contamination.

- The Great Lakes region is home to approximately 35.5 million people, a majority of whom depend on one of the five Great Lakes for drinking water.
- The region has also been subjected to decades worth of pollution, threatening the integrity of the Lakes and thereby of the water for consumption.
- Drinking water quality summarizes chemical, microbial, and radiological contaminant levels in drinking water and the effectiveness of policies and technologies used to determine whether or not we can drink the water from the Great Lakes.

The Indicator

The United States and Canada track the integrity of drinking water by assessing data from the nation's public water systems (PWSs). Specifically, we look for high concentrations of contaminants such as

- nitrate, an agricultural pollutant
- nitrate/nitrite, naturally occurring chemicals that are found at high levels in fertilizers and
- total coliform, E. coli, Giardia, Cryptosporidium disease-causing organisms that are undesirable water supplies.



Figure 1. Public water systems that provided data for the drinking water quality assessment, as reported in the State of the Great Lakes 2003 report.

We also monitor the turbidity, taste, odor and organic carbon content of drinking water supplies to assess for any other unresolved problems.

The Assessment

Chemical/Microbial Contamination

Arsenic, nitrate and nitrite are consistently found at minimal concentrations following water treatment processes. Public water suppliers have rarely if ever, found chemical levels exceeding drinking water standards between 2000 and 2002 (Table 1).

Contaminant/Parameter	2000	2001/2002
Number of Public Water Systems Exceeding	0	0

Table 1. Number of Arsenic, Nitrate/Nitrite violations of drinking water standards at reporting public water system facilities (2000-2002).

CAN WE DRINK THE WATER?
Drinking Water Quality

Interactive CD

Implementing Indicators 2003 – A Technical Report

State of the Great Lakes 2003

State of the Great Lakes (2001, 1999, 1997, 1995)

Fact Sheets

Indicator Descriptors

ABCs of Indicators

Plenary Presentations SOLEC 2002

Plenary PowerPoint Presentations

Web Site

www.binational.net



Keep 'Em Great!